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Comparative Study on Nutritional and Anti Nutritional Composition of Fresh and Dried Okra obtained from Gusau Market Nigeria

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ABSTRACT

Okra or commonly known in its Latin as abelmoschus esculentus are one of the green vegetables that is most consumed around the world and is utilized as medicine. Due to post-harvest losses, inadequate storage facilities lead to customers losing fresh okra. Therefore, farmers use traditional drying preservation methods by utilizing solar heat. The research objectives is to identify and evaluate the antinutrient, mineral, and proximate compositions of fresh and dried okra obtained from Gusau Market in Nigeria. Researchers analyzed and compared the samples using standard analytical methods and statistical packages from IBM SPSS version 21. The analysis revealed that the fresh and dried okra samples had the following amounts of water, ash, protein, fiber, carbs, lipids, and total energy: 75.30-8.56%; 1.85-8.05%; 16.44-77.25%; 4.30-2.03%; 0.18-3.15%; 1.93-0.96%; and 56.11-325.76%. While concentrations of mineral elements of fresh and dried okra are 98.22-97.80; 5.45-4.45; 9.75-9.35; 78.52-69.35; 21.36-19.26; and 30.52-29.60 in mg/100g respectively. The phytochemical screening shows the presence of Tannin, Oxalate, Phytate, Saponin, Phenolic, Flavonoid and Alkaloid. For sampling of fresh and dried okra, the amounts of flavonoid and alkaloid in mg/100g are 18.6-17.95 and 10.64-15.14, respectively. There is no significance different in proximate, mineral elements and anti nutritional content between fresh and dried okra samples. Therefore, the researchers can decide that the traditional way by utilizing solar heat is still being utilised by most of farmers. The appropriate method for farmers to prevent lossing okra when post-harvest is having conducive environment for them in order to avoid possible contamination.

Keywords: *Mineral Contents, Okra, Phytochemicals, Proximate Analysis*

INTRODUCTION

Okra or commonly known in its Latin as abelmoschus esculentus are one of the green vegetables that is most consumed around the world and is utilized as medicine. In northern Nigeria, fresh okra is a seasonal vegetable that produces a bountiful harvest from June to September (Nair & Fahsa, 2013). In today's market, fresh okra is easily accessible and less expensive. This vegetable can be cultivated during the entire season and is typically planted across Nigeria, especially in northern Nigeria, however it does not tolerate with waterlogging (Agomuo et al., 2022). Nigeria's growing population has raised the need for okra as a low-cost vegetable source for food and medicine. Farmers of okra have significant issues, including a scarcity of supply brought on by shifting seasons and a lack of facilities for suitable post-harvest handling and specialized storage (Agomuo et al., 2022).

In consequent, drying okra by utilizing solar heat is the only way for okra farmers to overcome post-harvest problems economically. All regions of Nigeria contribute to the okra production, but northern Nigeria produces the majority of it. Therefore, okra is available in almost all vegetable markets in Nigeria (Agomuo et al., 2022; Combo et al., 2020). Drying is a crucial step in the process of reducing humidity from fresh vegetables. It can be done by utilizing solar heat or other high-temperature drying techniques. The main objective of drying is to prevent the growth of bacteria that might degrade food and are found in vegetables with a high water content (Maturahmah et al., 2022).

Water is a simple molecule that has a very important role for life. A vegetable with high water content could potentially destroy the food. Therefore, efforts are needed to reduce the water content in vegetables in order to increase their shelf life. The drying method using the solar heat is an optimal traditional process that has been implemented by Nigerian farmers to increase the shelf life of most of their produce, including okra (Combo et al., 2020; Dubey & Mishra, 2017; Gemede et al., 2016).

Due to the increasing consumption of dried okra as an alternative for fresh okra, then this research aims to evaluate the nutritional, anti nutritional and mineral element contents of fresh and dried okra.

RESEARCH METHODOLOGY

The samples collection of this research is fresh and dried okra were obtained from Gusau market, Nigeria. The samples were kept in clean polythene bags, and the fresh samples were kept at 45°C in the refrigerator before being analyzed. For all the chemicals used were of analytical grade and used as its function.

Proximate Analysis of The Samples

Proximate analysis was conducted to determine the moisture content, ash content, fat/lipid, protein, fiber carbohydrate content and total energy. The water or

moisture content (%) and ash content (%) were determined based on the method described by Momoh (2022).

Determination of Crude Protein Content

Using a Kjeldahl digestion flask with potassium sulfate and sulphoric acid to digest fresh and dried samples individually, as well as distilling them at 420°C for 45 minutes and titrating the distillate with a known quantity of hydrochloric acid, the crude protein content was determined (AOAC, 2017).

$$\%\ crude\ protein = \frac{blank \times normality \times 14.01 \times 6.25}{weight\ of\ sample \times 10}$$

Determination of Fat/Lipid

Fat contents were estimated as crude ether extract using automatic soxtec extraction unit. During the extraction, which occurred for 60 minutes, the thimble containing the samples was raised and weighed using Opega's method (Ladi et al., 2017).

Determination of Crude Fiber

Both fresh and dried okra samples were boiled with 1.3% diluted sulfuric acid, rinsed with dilute water, and then boiled with diluted sodium hydroxide to determine the crude fiber content. The leftovers are classified as crude fiber (W et al., 2022).

Determination of Carbohydrate Content

According to Opega's technique, the proportion of carbohydrates was calculated by deducting the total of the contents of moisture, fat, protein, ash, and crude fiber from 100% (Ladi et al., 2017).

Carbohydrate Content (%) = 100 – (sum of moisture, ash, protein, crude fiber) %

Total energy in (Kcal)

This was determined by calculation, multiply protein, fat, and carbohydrate value obtained from the analysis by 4, 9, 4 respectively (Shuaibu, 2022).

Energy in Kcal = (protein) 4 + (fat) 9 + (carbohydrate) 4

Determination of Anti Nutritional Factors

Determination of Tannin

According to the method described in by Momoh, a variety of extractions were conducted to determine Tannin, and the concentration was determined using the tannic acid calibration curve (Shuaibu, 2022).

Determination of Oxalate Content

After extraction, the extract was titrated against 0.05 M potassium permanganate to determine the amount of oxalate (Ladi et al., 2017).

Determination of Phytate Content

Phytate content was determined by using comparison method from Momoh (2022) and Opega (2017). The extract was titrated with a standard iron chloride solution until a brownish yellow color persisted for five minutes as the end point, using ammonium thiocynate as an indicator. The amount of phytate was calculated as phytic acid.

Determination of Phenolic Acid

Ammonium hydroxide, alcohol, and 25 ml of ether were added to a weighed 5 g sample before it was heated. The solution was left to stand for 30 minutes to develop color. The samples' absorbance was measured at 505 nm using a UV spectrophotometer and calculated using a standard curve.

Determination of Saponin Content

The sample was put in a cleaned conical flask, 20% aqueous ethanol was added to it, and it was heated in a water bath for four hours while staring at 55°C. The solution was filtered, and the filtrate was concentrated at 90°C before being transferred to a separating funnel with the addition of diethyl ether, and the aqueous layer was discarded. Aqueous sodium chloride was used to rinse the extract. This was now dried in the oven and weighed until the weight of the saponin could be established as consistent (Ladi et al., 2017; Shuaibu, 2022).

Determination of Flavonoid

10 g of the sample were regularly extracted at room temperature with approximately 80% of a 100 ml volume of aqueous methanol, and then filtered with Whitman filter paper no. 42. (about 125mm in size). In a cup set over a water bath, the filtrate was evaporated to dryness until a consistent weight was produced (Ladi et al., 2017; Shuaibu, 2022).

Determination of Minerals Element

Using atomic absorption spectrophotometry, the samples were examined for the presence of mineral elements such potassium, sodium, magnesium, calcium, and zinc. A muffle furnace set at 550°C for five hours and a platinum crucible were used to weigh five grams of sample material. It was digested with 10% HCL, chilled in desiccators, and then filtered. Deionized water was used to completely fill the filtrate before it was tested for K, Na, Mg, Ca, and Zn (Ladi et al., 2017; Shuaibu, 2022). Using the Opega method, phosphorus was measured at 436 nm using a UV-visible spectrophotometer after creating an ammonium vanadate molydate complex.

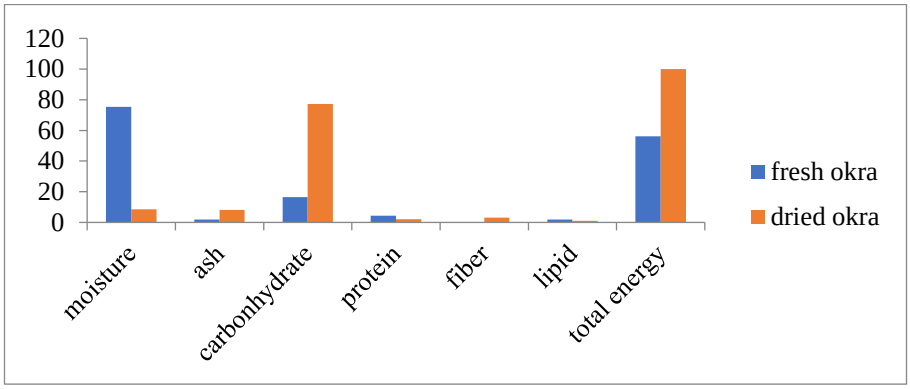
RESULT AND DISCUSSION

Proximate analysis which consists of ash content, moisture content, crude protein, fiber, lipid and carbohydrate are described in Table 1 as following below:

Table 1.1 The Proximate Analysis Results of Fresh and Dried Okra represented as a percentage (%)

Samples	Fresh Okra %	Dried Okra %	% Difference
Moisture	75.30	8.56	66.79
Ash	1.85	8.05	6.20
Carbohydrate	16.44	77.25	60.81
Protein	4.30	2.03	2.27
Fiber	0.18	3.15	2.97
Lipid	1.93	0.96	0.97
Total Energy	56.11	325.76	269.65

Table 1.2 The Bar Chart of Proximate Analysis of Fresh and Dried Okra



According to the findings, fresh okra's moisture content decreased from 75.30% to 8.56% following sun drying. As according Chukwuma, this renders the dried okra completely void of microbial activity (Chukwuma et al., 2018). In addition, Chukwuma stated that microbial activity increased in a higher moisture content in food substance. The proportion of carbohydrates in fresh okra was comparable to the quantity of carbohydrates acquired from matured okra, is according to Maria (2015). However, the moisture content of dried okra decreased, increasing the carbohydrate content from 16.44% in fresh okra to 77.25% in dried okra. This could be the cause of the dried okra sample's high energy calorie content.

Samples of fresh and dried okra had the following fiber, protein, and lipid compositions: 0.18%-3.15; 4.30%-2.03%; 1.93%-0.96%. This indicates that both types of dried okra might offer significant fiber content, which is crucial for lowering cholesterol circulation and raising the body's glucose tolerance level (Fekadu Gemede, 2015). It is important to be aware that the protein content of fresh okra decreases as it dries in the sun; this decrease in protein content can be indicated by the fact that protein can be denatured at high temperatures. Both adults and children can benefit from the protein that fresh okra can offer for tissue development (Fekadu Gemede, 2015).

The results of an analysis using IBM SPSS version 21 to determine whether there is a significant difference between the nutritional value of dried and fresh okra samples at a 95% level of confidence indicate that there is. The fact that there is a significant difference between fresh and sun-dried okra was also mentioned in the work of Agomuo (2022).

Table 2.1 The Minerals Composition Results of Fresh and Dried Okra (mg/100g)

Mineral Elements	Fresh okra (mg/100 g)	Dried okra (mg/100 g)
K	98.22.90±0.01	97.80 ±0.00
Na	5.45 ± 0.12	4.45 ±0.01
Mg	9.75 ±0.02	9.35 ±0.21
Ca	78.52 ±0.00	69.35 ±0.00
Zn	21.36 ±0.01	19.26±0.00
P	30.52 ± 0.15	29.60± 0.16

Description: K= Potassium; Na= Sodium; Mg= Magnesium; Ca=Calcium; Zn= Zinc; P= Phosphorus

Table 2.2 The Bar Chart of Mineral Elements in Fresh and Dried Okra

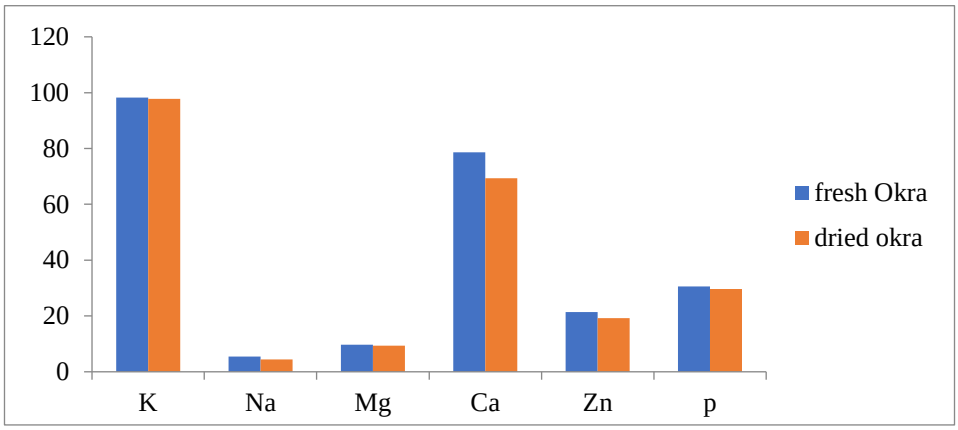


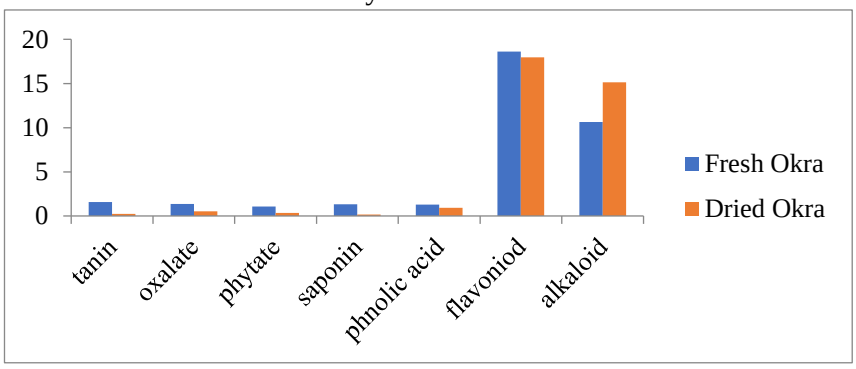
Table 2 illustrates the mineral composition of samples of dried and fresh okra. Once the fresh okra sample has been sun dried, indicate a slight reduction. However, the concentration of minerals in the fresh and sun-dried okra samples is not significantly different. This can be caused by a reduction in moisture content, which might also affect the fresh okra's mineral concentration (Combo et al., 2020).

Both adults and children need calcium for the creation of healthy bones. According to Opega's research described that during drying, the majority of the soluble ions escape. As a consequence, the growth of fresh and dried okra can supply enough calcium to body tissues, hence preventing osteoporosis in adults, rickets in adolescents, and colon cancer. Okra is frequently used as a therapeutic vegetable, eaten raw, or cooked in soups and other dishes. Both fresh and dried okra provide all the necessary minerals in suitable amounts that are beneficial for bone development, enzyme responses, blood formation, nerve function, and blood cell synthesis for pregnant women. Potassium and phosphorus are also important for maintaining proper growth (Assi et al., 2017; Nair & Fahsa, 2013).

Table 3.1 The Results of Anti Nutritional Factor of Fresh and Dried Okra represented in Mean ± Standard Deviation

Phytochemicals mg/100g	**Fresh okra**	**Dried okra**
Tannin	1.59 ± 0.009	0.23 ± 0.0141
Oxalate	1.34 ± 0.531	0.51 ± 0.070
Phytate	1.27 ± 0.109	0.34±0.0333
Saponin	1.33 ± 0.0192	0.15 ± 0.0233
Phenolic acid	1.267 ± 0.0141	0.91 ± 0.050
Flavonoid	18.6 ± 0.0924	17.95 ± 0.303
Alkaloid	10.64 ± 0.0925	15.14 ± 0.07

Table 3.2 The Bar Chart of Phytochemicals Present in Fresh and Dried Okra



Okra contains tannin, oxalate, phytate, saponin, phenolic, flavonoid, and alkaloid compounds both since it is fresh and after this one is dried, as indicated in Table 3, however there is a significant decrease after sun drying. These may be related to phytochemicals' volatility which makes significant amounts of them escape during drying (Kouassi et al., 2013; Ladi et al., 2017).

For absorbing the divalent and multivalent elements needed by cancerous cells to proliferate, phytate concentration lowers the risk of cancer and can affect the functional and nutritional qualities of foods. Phytate concentration can also lower blood glucose and cholesterol depending on concentration (Kouassi et al., 2013).

According to experts, okra has medicinal benefits for anticancer, antioxidant, anti-inflammatory, and antiviral functions. The high concentration of flavonoid around 18.6% in fresh and 17.95% in dried okra further supports this assertion (Omoniyi et al., 2021). The biological benefit of the alkaloid which is present in

both fresh and dried okra in amounts of 10.62 % and 15.14 %, it was also described as an anesthetic, cardioprotective, and anti-inflammatory agent (Perez et al., 2013).

CONCLUSION

The technique by utilizing solar heat as means of storing and mitigating the post harvest loss okra and other fresh vegetable still remain the available method. The findings of this research allow the researchers to decide that post-harvest losses of fresh okra vegetables can be avoided even though the drying process was applied. The statistical analysis indicates a significant differential between fresh and dried okra in the proximate analysis. The mineral components of both fresh and dried okra are identical. During the sun-drying of okra samples, a significant loss of antinutritional content from fresh to dried okra was discovered. Furthermore, after drying, the alkaloid and flavonoid content is still high. In order to prevent potential microorganism contamination and to adhere to the international standard for food processing practice, it is required to create a conducive environment for the drying process.

Conflict of Interest

None of the researchers have any conflicting interests.

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